

## **CROSS CONNECTION CONTROL RECERTIFICATION OF TESTERS**

This letter is to confirm that your application for renewal of your backflow prevention device testers certification card has been received by this office. However, in order for this request to be granted you will have to comply with the following instructions and guidelines.

1. Contact one of the state sponsored regional certification renewal facilities. The attached sheet shows a complete list with locations, addresses and phone numbers.
2. Study the enclosed information prior to showing up for the recertification process.
3. A nominal fee, not to exceed fifty dollars ( \$50.00 ) may be charged by the testing agency or agent for this service.
4. Upon completion of all phases of the recertification process, your paper work will be sent to the DHEC Central Office in Columbia for review. If everything is in order then a new tester's certification card will be printed and mailed to you, along with other related materials.

If you should have additional questions please feel free to call ( 803 ) 898-3567 and ask for the Cross Connection Control Program Coordinator.

## **SATELLITE WET LABS**

All applicants for renewal will have to go through the testing requirements as prescribed by this office at one of the regional wet labs prior to receiving any renewal of their testing card or certification number from this office.

This procedure will include five ( 5 ) requirements for the testers to complete.

1. Your differential gauge will be tested for accuracy by the proctor or examiner at the regional wet lab testing site. ( If the gauge is out of tolerance it will have to be sent back to the factory or some other qualified company and brought back into accuracy of 2 per cent of scale. This translates into plus or minus .3 PSID ).
2. Applicants will be required to take a brief written exam of about twenty five ( 25 ) questions. Applicants must obtain a score of 70 % or better in order to pass.
3. Applicants must test one RP assembly ( preferably with applicants own gauge ).
4. Applicants must test one DCVA with the vertical tube method. ( Tester should own a vertical tube, but this is not currently a requirement ).
5. Applicants must test one PVB ( preferably with applicants own gauge ). ( No back-pressure test acceptable, only direction of flow or differential pressure test.)

If applicant passes all phases of this test then his paper work will be forwarded to DHEC for processing. If all criteria are met then a new certification card will be issued and mailed to applicant. This process will have to be repeated in three years from date of renewal.

## **BACKFLOW PREVENTION RE-CERTIFICATION STATIONS**

Below is a listing of all of the current re-certification stations for backflow prevention assembly testers in South Carolina.

You are free to select the one of your choice and make arrangements to participate in the renewal process. You may receive additional information by calling the number of the station of your selection. The proctor will provide you with dates, costs, and locations of the next scheduled exam.

MR. DAVID ZORN  
DEPT. OF PUBLIC UTILITIES  
P.O. BOX 1057  
ORANGEBURG, SC 29116-1057  
(803) 534-2821

MR. CHARLES CLINEMYER, JR  
GREENWOOD C.P.W.  
P.O. BOX 549  
GREENWOOD, SC 29648  
(864) 942-8196

MR. HARRY PEART  
CITY OF ROCK HILL  
P.O. BOX 11706  
ROCK HILL, SC 29731-1706  
(803) 329-5698

MR. J.T. JOHNSON  
J T JOHNSON BACKFLOW  
420 BEVERLY DRIVE  
CHERAW, SC 29520  
(843) 537-4230

MR. DALE STRONG  
CHARLESTON C.P.W.  
103 ST. PHILIP STREET  
CHARLESTON, SC 29403  
(843) 727-6981

MR. KENNETH A. DAVIS  
SPARTANBURG WATER SYSTEM  
P.O. BOX 251  
SPARTANBURG, SC 29304  
(864) 253-9304 ext 163

MR. ED MAKISON  
ANDERSON REGIONAL WATER  
998 HUNTERS TRAIL  
ANDERSON, SC 29625  
(864) 332-0279 OR (864) 332-6534

MR. ALEX CRIBB  
CITY OF GEORGETOWN  
P.O. DRAWER 939  
GEORGETOWN, SC 29442-0939  
(843) 545-4511

MS. ANN WOOD  
CITY OF COLUMBIA  
2910 COLONIAL DRIVE  
COLUMBIA, SC 29203  
(803) 545-3876

MR. ALVIN ARD  
CITY OF FLORENCE  
180 NORTH IRBY STREET  
FLORENCE, SC 29501  
(843) 665-3236

## STUDY SHEET FOR RECERTIFICATION TEST

The primary responsibility for implementing and maintaining the drinking water protection program ( including the cross connection control program ) rests with the water purveyor. Courts have ruled that the town, city, commission, or district which sells and purveys ( distributes ) the water is the water purveyor, and the responsibility of complying with state, federal, and local laws and ordinances rests with the water purveyor.

The State Primary Drinking Water Regulations require that fire line sprinkler systems in S.C. be protected by a minimum of an approved Double Check Valve Assembly. The Reduced Pressure Backflow Prevention Assembly is required if antifreeze or foaming agents are added to the fire sprinkler systems. Chemical additives to a fire sprinkler system would be considered a " high hazard " cross connection.

The two forms or types of backflow are back siphonage and back pressure.

The pressure vacuum breaker must be installed 12" above any downstream plumbing or sprinkler head. The atmospheric vacuum breaker must be installed 6" above any downstream plumbing or sprinkler head.

An air gap is considered to provide even a higher degree of protection than an R.P. The formula for determining what an air gap should be is two times the supply pipe in diameter or never less than one inch. However, the R.P. is the best **mechanical** backflow prevention assembly for a high or health hazard cross connection.

When testing a reduced pressure principle assembly, the pressure differential relief valve must operate to maintain the zone between the two check valves at least **2.0 psid** less than supply pressure. Also, the second check valve on a reduced pressure principle assembly must be **1.0 psid or greater**.

When testing the first check valve on a reduced pressure principle assembly, the acceptable value is **5.0 psid or greater**. If the differential pressure drops below 5.0 psi when testing the first check valve, it must be repaired and retested.

The best and most prescribed test for the DCVA in S.C. is the **DIRECTION OF FLOW - VERTICAL TUBE** test. This test creates one PSI of pressure on the supply side of each check valve by filling the vertical tube to a level of 27 and 3/4" from the center of the outlet at the bottom of the tube.

## STUDY SHEET PAGE #2

In testing the # 2 check valve on the R.P., if trash is caught in the # 2 check valve and it is leaking because of back-pressure from the customers facility this should cause pressure in the zone to increase, thereby causing the differential gauge to fall, and eventually the zone will begin to discharge or dump water from the relief valve.

A **CROSS CONNECTION** is defined as, " Any actual or potential, direct, or indirect, link, connection, or arrangement between a potable water supply system and any other non-potable water source, which could allow the introduction of a contaminate into the potable water supply system.

An approved DCVA is designed and approved to protect the public water supply system from a " low hazard or non health hazard " category cross connection. Both check valves in a DCVA must hold **1.0 psid** or greater.

An approved R.P. and Air Gap are designed and approved to protect the public water supply system from a " high hazard or health hazard " category cross connection.

Back pressure occurs when the customers internal water pressure exceeds the supply pressure. Back siphonage occurs when the potable or drinking water supply drops below atmospheric pressure, which is 14.7psi at sea level.

A barometric loop is a piping arrangement that makes use of the principle that a perfect vacuum can only lift water vertically for 33.9 feet.

Since January 1, 1992, DHEC has required the use of resilient seated ball valves on all R.P.'s and DCVA's from ½ up through the size of 2", and the use of resilient wedge gate valves on all R.P.'s and DCVA's in size 2 ½ and larger.

When testing a double check valve assembly with a differential gauge and you use both the high hose and low hose, this test procedure is called **differential pressure**. However, if you only use (1) hose which would be the high hose, this test procedure is called **direction of flow**.

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This study sheet is not designed to cover every question which is found on the recertification test. Neither is it meant to cover all of the information which is covered in the DHEC sponsored three day certification seminar. There are a number of questions pertaining to trouble shooting and testing the R.P. and DCVA, as well as some general knowledge questions which you, as a tester are expected to already know. If you have been properly testing assemblies in the past you will not have any problems with those questions. If you have not been properly testing, diagnosing, and repairing assemblies then the place to be retrained for that is in the three day seminar. The purpose of the recertification testing is not to teach the course over again, but to allow qualified testers to prove their qualifications.

**STATE PRIMARY DRINKING WATER REGULATIONS  
AS AMENDED APRIL 29, 2005  
R.61-58.7(F)**

**F. Cross Connection Control**

**(1) General**

(a) All public water systems shall initiate and maintain a viable cross connection control program. Such a program shall consist of:

- (i) Locating and eliminating unprotected cross connections.
- (ii) Maintaining records pertaining to the location of existing backflow prevention assemblies, type and size of each assembly and annual test results.

(b) No person shall install, permit to be installed or maintain any cross connection between a public water system and any other non-public water system, sewer or a line from any container of liquids or other substances, unless an approved backflow prevention device or assembly is installed between the public water system and the source of contamination.

**(2) Low Hazard Cross Connections**

A connection between an approved public water system and another water source not hazardous to health but not meeting the standards of the approved public water system and not cross-connected within its system with a potentially dangerous substance shall be considered a low hazard category cross connection. At a minimum, an approved Double Check Valve Assembly or Pressure Vacuum Breaker must be installed on a low hazard cross connection except as provided for in section 3 below.

**(3) Residential Lawn Irrigation Systems**

(a) Low hazard residential lawn irrigation systems - Each public water system which has low hazard residential irrigation systems directly or indirectly connected to their public water system must have a written low hazard residential lawn irrigation system cross connection control policy. This policy must be documented in writing and must be approved by the governing body of the public water system. The policy must specify the minimum acceptable device for low hazard residential lawn sprinkler systems. The minimum acceptable device for low hazard residential lawn sprinkler systems is a residential dual check. If a water system specifies another backflow prevention assembly as the minimum acceptable protection for these cross connections, the policy must be approved by the governing body of the public water system with due opportunity being provided for public comment and participation. The written policy must:

- (i) Identify the type of backflow prevention device or assembly that is required to be installed on low hazard residential lawn irrigation system connections.

(ii) Establish a schedule for the required testing of double check valve assemblies, or other testable assembly, if testable assemblies are designated by the policy as minimum acceptable protection for low hazard residential lawn irrigation systems. The minimum testing frequency must be specified in the policy and appropriate records must be maintained to verify compliance with the established testing requirements.

(iii) Establish a schedule for the required change out of residential dual checks if these are the devices designated by the policy as minimum acceptable protection for low hazard residential lawn irrigation systems. The minimum change out frequency must be specified in the policy and appropriate records must be maintained to verify compliance with the established change out requirements.

(b) High hazard residential lawn irrigation systems – Any residential lawn irrigation system that includes chemical addition, or is also connected to another water source which is not an approved public water system, shall be considered a high hazard cross connection and must meet the requirements of paragraph (4) below.

(4) High Hazard Cross Connections

(a) A connection between an approved public water system and a service or other water system which has or may have any material in the water dangerous to health, or connected to any material dangerous to health, that is or may be handled under pressure, or subject to negative pressure, shall be considered a high hazard category cross connection. Protection shall be by air gap separation or an approved reduced pressure principle backflow prevention assembly.

(b) Reduced pressure principle backflow prevention assemblies shall not be installed in any location subject to possible flooding. This includes pits or vaults which are not provided with a gravity drain to the ground's surface that is capable of exceeding the discharge rate of the relief valve.

(5) Fire Sprinkler Systems

Fire line sprinkler systems, except those in the high hazard category shall be protected by an approved double check valve assembly. High hazard fire sprinkler systems shall include, but not be limited to: antifreeze systems, foam systems, systems charged from or tied into ponds, lakes, streams, or any water source other than the approved public water supply. High hazard category fire sprinkler systems shall comply with the requirements of Paragraphs (4) above.

(6) Approved Devices and Assemblies

The Department shall prepare and publish a list of backflow prevention assemblies approved by the Department for use in S.C., and this list shall be updated at least once annually.

## (7) Testing Requirements

When double check valve assemblies, pressure vacuum breakers, and/or reduced pressure principle backflow prevention assemblies are installed to protect a public water system against the possibility of backflow from a customer's water service, routine testing of the assemblies shall be performed by a certified tester.

- (a) Each assembly shall be tested by a certified tester after installation and before use by the customer. Except as specified in paragraph 3(a)(ii) above, each assembly shall be tested at least once annually by a certified tester.
- (b) The public water system is to receive a written report of the inspection and testing results for all assemblies tested within its distribution system. The report shall be submitted by the certified tester making the inspection and test.
- (c) All backflow prevention assemblies shall be tested immediately after repairs of any kind are made to the assembly.

## (8) Backflow Prevention Tester Certification

There are four (4) types of certified testers of backflow prevention assemblies; General Tester, Limited Tester, Inspector Tester, and Manufacturer's Agent. The definition of each type of certified tester is specified in R.61-58(A).

- (a) Each certified tester's license shall expire three (3) years from the date of issue. In order to renew this certification for three (3) more years, the tester shall come before a designated person approved by the Department and shall successfully complete a written examination with a passing score of 70%, and perform the prescribed test on an approved reduced pressure principle backflow prevention assembly, double check valve assembly, and a pressure vacuum breaker using the tester's own differential pressure gauge. The gauge must be accurate within 2% of full scale or  $\pm 0.3$  pounds per square inch differential (PSID). Any gauge found to be inaccurate or malfunctioning will be required to be calibrated or repaired as needed to bring it into compliance before certification will be renewed.
- (b) Any applicant for certification who fails to properly perform the above prescribed tests will have his certification revoked immediately and will have to successfully complete the state sponsored backflow prevention training and certification course in order to become re-certified as a tester of backflow prevention assemblies in South Carolina.
- (c) A certified tester may have his tester's certification revoked due to incompetence or falsification of test results, as determined by the Department.
- (d) The Department shall reserve the right to charge or allow for the charge of a nominal fee for the administration of the recertification of testers. This fee shall not exceed fifty dollars (\$50.00).

## (9) Installations of Pressure Vacuum Breakers

Where used, pressure vacuum breakers shall be installed at a minimum of 12" inches above the highest downstream piping and shall not be subject to backpressure.

(WATER SYSTEMS PLEASE USE YOUR OWN LETTERHEAD)



# BACKFLOW DEVICE TEST REPORT FORM

Date: \_\_\_\_\_

Account Name/Business Name: \_\_\_\_\_

Account Address: \_\_\_\_\_

Account Number: \_\_\_\_\_ Meter Number: \_\_\_\_\_

Device Name: \_\_\_\_\_ Model Number: \_\_\_\_\_

Serial Number \_\_\_\_\_ Size: \_\_\_\_\_

Device Location: \_\_\_\_\_

Tested by (PRINT) \_\_\_\_\_

	Check No. 1	Check No. 2	Air-Inlet Valve or Relief Valve	#1 Gate or Ball (Circle One)	#2 Gate or Ball (Circle One)
Test Before Repairs	(Mark One) Leaked _____ Closed _____ Tight _____	(Mark One) Leaked _____ Closed _____ Tight _____	Opened at _____ lbs. Differential Pressure	(Mark One) Leaked _____ Closed _____ Tight _____	(Mark One) Leaked _____ Closed _____ Tight _____
	Diff Press _____	Diff Press _____			
Repairs and New Materials					
Test After Repairs	(Mark One) Leaked _____ Closed _____ Tight _____	(Mark One) Leaked _____ Closed _____ Tight _____	Opened at _____ lbs. Differential Pressure	(Mark One) Leaked _____ Closed _____ Tight _____	(Mark One) Leaked _____ Closed _____ Tight _____
	Diff Press _____	Diff Press _____			

Above data certified to be correct.

Tester Signature: \_\_\_\_\_ Certification Number: \_\_\_\_\_

Company Name: \_\_\_\_\_ Company Telephone Number: \_\_\_\_\_

Category: \_\_\_\_\_ General \_\_\_\_\_ Limited \_\_\_\_\_ Inspector Tester: \_\_\_\_\_

Method of Testing: \_\_\_\_\_ Test Kit Used: \_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## **DOUBLE CHECK VALVE ASSEMBLY TEST**

### **(USING THE VERTICAL TUBE)**

This testing procedure takes advantage of the fact that ONE PSI of pressure is created at the base of a 27 ¾" high water column. The tricky part of this test is that the pressure is applied on the up-stream (or supply) side of the check valve and in direction of flow rather than as back pressure.

A big advantage of this test is that it may be performed on assemblies which have a missing # 1 test cock or which may have a leaking # 1 shut off valve. A moderate amount of leakage past the first shut off valve can be tolerated since that leakage will simply spill out the top of the 27 ¾" water column. Also, a small test cock may be installed at the base of the water column which may be opened to allow the appropriate amount of water to spill out, maintaining the 27 ¾" level in the water column.

#### **TEST PROCEDURE:** (Check valve # 1)

1. OPEN AND CLOSE ALL TEST COCKS INDIVIDUALLY TO FLUSH OUT ANY SEDIMENT OR SCALE.
2. INSTALL VERTICAL TUBE ONTO TEST COCK # 2.
3. OPEN TEST COCK # 2 AND ALLOW WATER TO FILL THE TUBE. (A column of water 27 ¾" high creates 1 psi of pressure at its base) WHEN THE 27 ¾" TUBE IS FILLED, CLOSE TEST COCK # 2.
4. CLOSE SHUT-OFF VALVE # 1 AND # 2.
5. OPEN TEST COCK # 3 first; then open # 2. (Position the base of the tube at the same level as test cock # 3.) Some leakage will occur from test cock # 3 as water escapes from the body of the valve. However, if leakage continues to occur then water is passing through check valve # 1, **INDICATING A FAILURE OF CHECK VALVE # 1.**

**\*NOTE:** Leakage out of test cock # 3 should be accompanied by a fall in the water level of the vertical tube, unless shut-off valve # 1 is leaking enough to keep the vertical tube full and/or over flowing.

#### **TEST PROCEDURE:** (Check valve # 2)

- (A). CLOSE TEST COCKS # 2 AND # 3.
- (B). REMOVE THE VERTICAL TUBE FROM TEST COCK # 2 AND INSTALL IT ONTO TEST COCK # 3.
- (C). OPEN SHUT-OFF VALVE # 1 AND TEST COCK # 3 IN ORDER TO FILL THE VERTICAL TUBE TO THE 27 ¾" LEVEL.
- (D). CLOSE TEST COCK # 3 AND SHUT-OFF VALVE # 1.
- (E). OPEN # 4 TEST COCK FIRST; then open # 3. (Position the base of the tube at the same level as test cock # 4.) Some leakage will occur from test cock # 4 as water drains from the body of the valve. HOWEVER, IF LEAKAGE CONTINUES TO OCCUR THEN WATER IS PASSING THROUGH CHECK VALVE # 2, **INDICATING A FAILURE OF CHECK VALVE # 2.**

**\*NOTE:** Leakage out of test cock # 4 should be accompanied by a fall in the water level of the vertical tube, unless shut-off valve # 1 is leaking enough to keep the vertical tube full and/or over flowing.

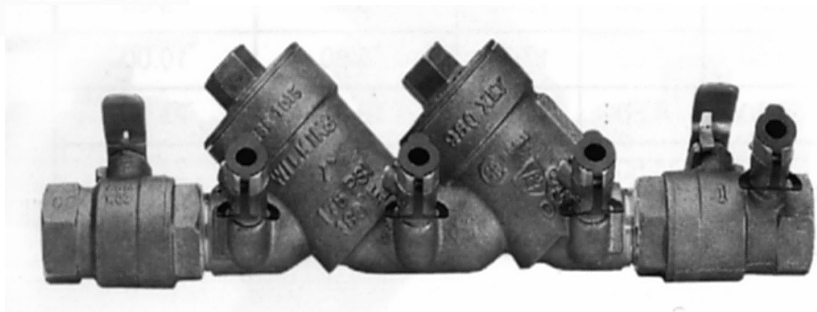
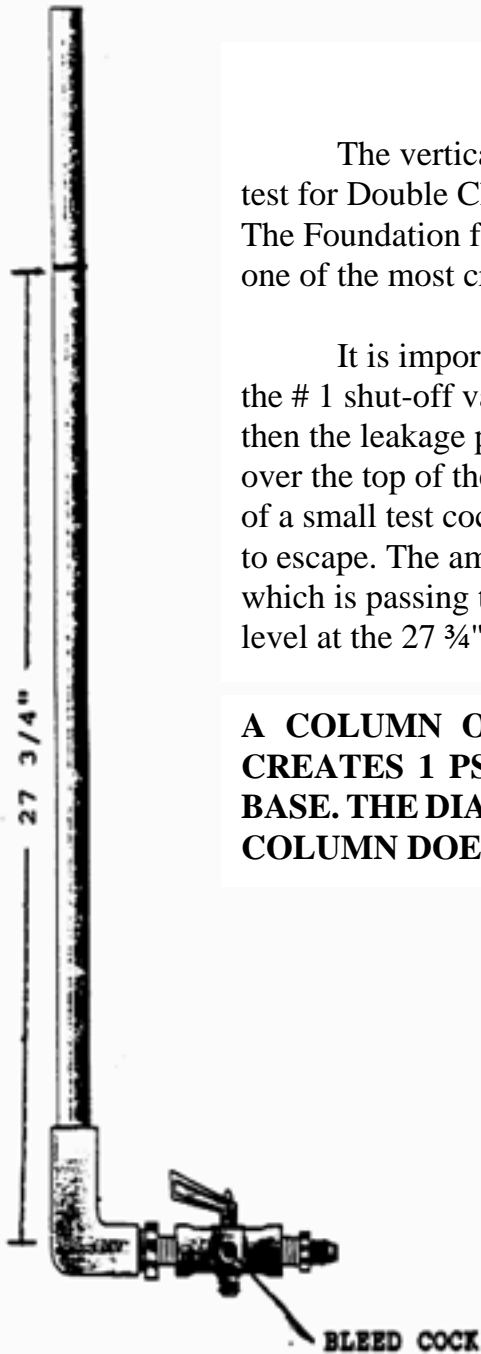
- (F). **CLOSE ALL TEST COCKS AND OPEN ALL SHUT-OFF VALVES BEFORE LEAVING THE ASSEMBLY.**

## VERTICAL TUBE TEST

The vertical tube or water column test is one of the **BEST** prescribed test for Double Check Valve Assemblies. This test is recognized and endorsed by The Foundation for Cross Connection Control and Hydraulic Research as being one of the most credible procedures for testing the DCVA.

It is important to remember that the vertical tube test **can** be used when the # 1 shut-off valve is leaking slightly. If the tube is cut off at exactly  $27 \frac{3}{4}$ " then the leakage past the # 1 shut-off valve can simply flow out to atmosphere over the top of the tube. If the vertical tube is over  $27 \frac{3}{4}$ " tall then the installation of a small test cock at the base of the tube can be opened to allow for the leakage to escape. The amount of leakage which escapes must be the same as the amount which is passing through the # 1 shut-off valve in order to maintain the water level at the  $27 \frac{3}{4}$ " level.

**A COLUMN OF WATER  $27 \frac{3}{4}$ " HIGH CREATES 1 PSI OF PRESSURE AT ITS BASE. THE DIAMETER OF THE PIPE OR COLUMN DOES NOT MATTER.**



**THESE DIRECTIONS ARE FOR THE FIVE (5) VALVE TEST KIT**  
**DOUBLE CHECK VALVE TEST**  
**DIRECTION OF FLOW**

**IMPORTANT:** SINCE THE GAGE AND LOW HOSE MUST BE HELD AT THE SAME LEVEL AS THE DCVA AND SINCE MANY SMALL DCVA'S ARE INSTALLED IN METER BOXES WITH VERY CLOSE SIDE CLEARANCES, THIS TEST MAY NOT BE ACCEPTABLE IN SUCH INSTANCES. IF SO, YOU MAY SUBSTITUTE THE VERTICAL TUBE TEST. THE THEORY AND PRACTICE ARE SIMILAR ON THESE TWO TESTS.

**TEST PROCEDURE**

**Test Check Valve # 1**

1. Close all (5) valves on test kit.
2. Attach high hose of gage to test cock # 2.
3. Slowly open test cock # 2.
4. Open high bleed valve on test kit and bleed air from kit.
5. Close high bleed valve after air is expelled.
6. Close shut-off valve # 2 then # 1 (With both shut-off valves now closed pressure is trapped inside of the DCVA.)
7. Open test cock # 3 (Test cock # 2 should still be open.)
8. At this point, the gage needle **must not drop below 1.0 psi**.
9. If the gage needle holds at **1.0 psi** or greater then the check valve is holding tight.

**Test check valve # 2**

1. Close test cocks # 2 and # 3 on the DCVA and close the high bleed valve on the test kit.
2. Move the high hose from test cock # 2 to test cock # 3.
3. Open shut-off valve # 1.
4. Slowly open test cock # 3.
5. Open high bleed valve on test kit and bleed air from kit.
6. Close high bleed valve after air is expelled.
7. Close shut-off valve # 1. (Pressure is trapped inside of the DCVA.)
8. Open test cock # 4. (Test cock # 3 should still be open.)
9. If the gage needle holds at **1.0 psi** or greater then the check valve is holding tight.

**-IN CLOSING-**

1. Close all test cocks, remove hoses, and brass fittings.
2. Open customer hose bibb for flushing if possible.
3. Slowly open both shut-off valves on DCVA.
4. Allow water to flow for a minute from the open hose bibb.
5. Close hose bibb.
6. Check with customer, flush a toilet, and/or run some water within the facility if possible before leaving.

**ALL VALVES ON THE TEST KIT SHOULD BE OPENED AND THE KIT ALLOWED TO DRAIN PRIOR TO STORAGE. THIS IS ESPECIALLY IMPORTANT DURING COLD WEATHER DUE TO THE DANGER OF FREEZING.**

**NOTE\*\*\* THE ABOVE TESTING PROCEDURE IS CONDUCTED WITH THE #1 SHUT-OFF VALVE IN THE CLOSED POSITION. THIS MEANS THAT THE #1 SHUT-OFF VALVE MUST NOT LEAK. OPEN TEST COCK # 2 AND INSPECT FOR CONTINUOUS LEAKAGE. IF THE # 1 SHUT-OFF VALVE IS LEAKING THEN YOU CAN NOT USE THIS TEST. HOWEVER, THE VERTICAL TUBE OR DIFFERENTIAL PRESSURE TEST CAN BE USED ON DCVA'S WHERE SMALL LEAKAGE OCCURS PAST THE # 1 SHUT-OFF VALVE.**

## DIFFERENTIAL PRESSURE TEST USING A (5) VALVE DIFFERENTIAL GAGE

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### DOUBLE CHECK VALVE ASSEMBLY

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#### Performed with the first shut-off valve open

This test is performed with the DIFFERENTIAL PRESSURE GAUGE test kit. As you will recall from the R.P. test, the differential pressure gauge simply measures the pressure drop across the check valve. This pressure drop is normally the same as the strength of the check valve spring. In using the differential pressure gauge to test the double check valve assembly, a minimum of 1.0 PSID is required for each check valve in order for that check valve to pass the test. Such a small reading is often difficult to read on most kits. This is one of the drawbacks of this test. However, since the first shut-off valve is left in the open position for this test, it is possible to use this test when the first shut-off valve is leaking badly.

#### TEST PROCEDURE

##### **PREP WORK:**

- 1) Notify customer that the water service will be off. Identify the make, model, and serial number on the backflow device. Inspect that this is an approved assembly: 2-check valves, 2-shut-off valves, 4-test cocks. Observe the area to make sure there are no leaks.
- 2) Flush test cocks (1,2,3,4) then close all test cocks.
- 3) Install brass fittings in the test cocks.
- 4) Close shut-off valve # 2.

##### **TEST CHECK VALVE # 1**

- 1) Close all valves on test kit.
- 2) Connect the high side hose to test cock # 2, and the low side hose to test cock # 3. Open test cock # 2 and test cock # 3.
- 3) Open the low bleed valve and then the high bleed valve. This will expel all air from gauge. Close high bleed valve, then low bleed valve.
- 4) Record the gauge reading. **It must be at least 1.0 PSID in order to pass.** Close test cock # 2 and # 3.

##### **TEST CHECK VALVE # 2**

- 1) Move the high hose to test cock # 3, and the low hose to test cock # 4. Open test cock # 3 and test cock # 4.
- 2) Open the low bleed valve and then the high bleed valve. This will expel all air from gauge. Close high bleed valve, then low bleed valve.
- 3) Record the gauge reading. **It must be at least 1.0 PSID in order to pass.** Close test cock # 3 and # 4. Remove hoses, brass fittings, and test kit. **Slowly** open shut-off valve # 2 in order to restore water flow to the facility (placing the DCVA back into service.)

## TEST FOR LEAKING # 2 SHUT-OFF VALVE

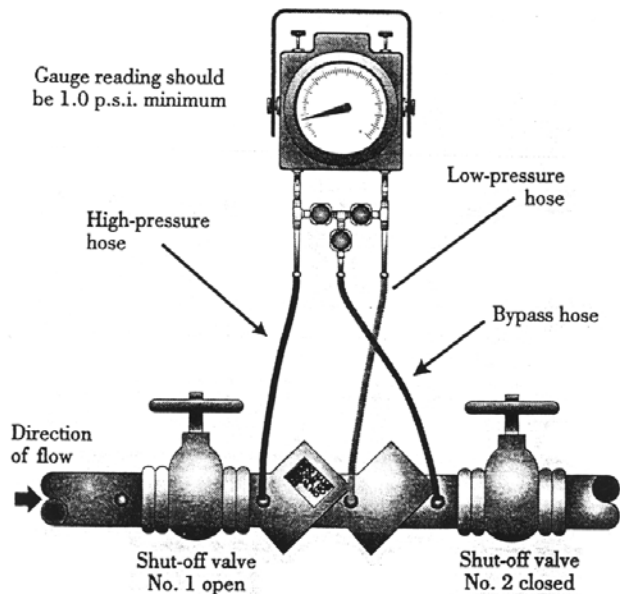
AS PREVIOUSLY MENTIONED, THE ABOVE TEST IS NOT ACCURATE WHEN THE SECOND SHUT-OFF VALVE IS LEAKING. THE FOLLOWING TEST WILL EXPOSE A LEAKING SHUT-OFF VALVE.

- 1) Both shut off valves should be open. Make sure all valves on test kit are closed. Connect the high side hose to test cock # 2 and the low side hose to test cock # 3. Open test cock # 2 and test cock # 3.
- 2) Open the low bleed valve, then the high bleed valve to expel all air out of gage. Close the high bleed valve, then the low bleed valve.
- 3) Open the high control valve on full turn, then open the vent / by pass valve to bleed air from kit. Close high control valve and vent / by pass valve.
- 4) Connect the vent / by pass hose to test cock # 4. Open test cock # 4
- 5) Close shut-off valve # 2 and the gauge should read at least **1.0 PSID** in order to pass.
- 6) Open the high control valve one full turn and then open the vent / by-pass valve. This will put back pressure on check valve # 2.
- 7) Close test cock # 2.

**IF GAUGE IS STEADY THEN SHUT-OFF VALVE # 2 IS HOLDING TIGHT.**

**HOWEVER, IF GAUGE DROPS TO ZERO PSID THEN SHUT-OFF VALVE # 2 IS LEAKING.**

**IF THE GAUGE RISES THEN THE # 2 SHUT-OFF VALVE IS STILL LEAKING, BUT IS UNDER BACK PRESSURE FROM THE FACILITY.**



# TEST PROCEDURE USING A (5) FIVE VALVE DIFFERENTIAL GAGE

## REDUCED PRESSURE BACKFLOW PREVENTER

### TEST SET UP

Notify customer water will be off, inspect device for leaks, and verify the make, model, & serial number.

Flush test cocks in order (4-1-2-3), without making the relief valve open, then install brass fittings.

Close all 5 valves on test kit, and close the # 2 shut-off valve.

Connect high hose to test cock # 2, and low hose to test cock # 3.

Slowly open test cock # 3, then open low bleed valve.  
Slowly open test cock # 2, then open high bleed valve.  
Close high bleed valve, then close low bleed valve.

Observe this **apparent** differential pressure for check valve # 1, this value must be at least 5.0 PSI or greater.

### TEST NO. 1

Purpose: To test check valve # 2 against back pressure.

Open the high control valve one full turn. Open vent "C" valve to bleed air. Close vent "c" valve. Connect the vent / by-pass hose to test cock #4. Open the vent / by-pass valve. Open test cock # 4.

Gage may decrease slightly due to disc compression. If pressure differential continues to decrease until the vent opens, then check valve # 2 is reported as leaking.

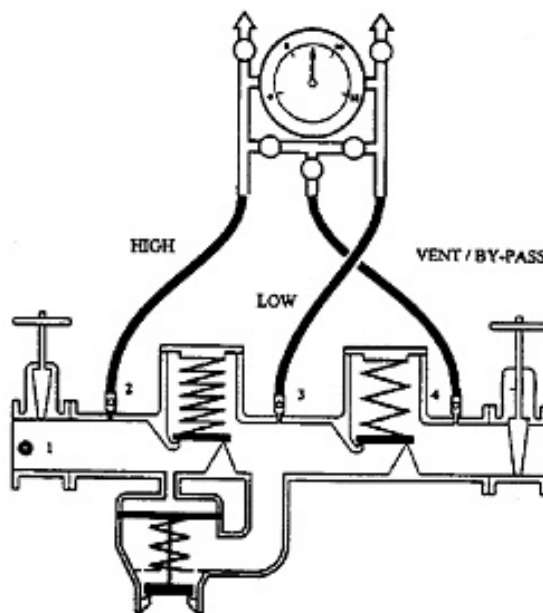
### TEST NO. 2

Purpose: To test shut-off valve # 2 for tightness.

After passing test No. 1 continue to test No. 2 by closing test cock # 2. The indicated pressure differential will decrease slightly. If pressure differential continues to decrease (approaching zero) the No. 2 shut-off valve is reported to be leaking

### TEST NO. 3

Purpose: To test check valve # 1 for tightness.



Close vent / by-pass valve. Close test cock #4 and remove vent / by-pass hose from test cock #4. Open test cock #2.

Open low bleed valve to expel air from low side of gage, then open high bleed valve to expel air from high side of gage. Close high bleed valve, close low bleed valve. Observe the differential pressure gage, this value must be at least 5.0 PSI or greater. Record this value for check valve # 1 on the backflow test report form.

### TEST NO. 4

Purpose: To test operation of the differential pressure relief valve.

The pressure differential relief valve must operate to maintain the "zone" between the two check valves at least 2 psi less than supply pressure. The high control valve has been open since test # 1, so slowly open the low control valve no more than 1/4 turn. Hold the valve at this position and observe the gage reading at the first moment the first discharge is noted from the relief valve. Record this as the opening differential pressure of the relief valve on the test report form.

**On the back of this page is a differential pressure test for check valve # 2. Check valve # 2 must be at least 1.0 psi or greater.**



## **DIFFERENTIAL PRESSURE TEST ON CHECK VALVE # 2**

**Check valve # 2 must be at least 1.0 psi or greater**

**Test # 5 is a required test. In addition to test # 1 which is a back pressure test on check valve # 2, you must perform this differential pressure test to confirm the true integrity of check valve # 2.**

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### **TEST NO. 5**

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Purpose: To do a differential pressure test instead of a back pressure test on check valve # 2.

After completing test No. 4 close test cock # 2, then close test cock # 3. Close all 5 valves on test kit.

Move low hose to test cock # 4, then move high hose to test cock # 3.

Slowly open test cock # 4, then open the low bleed valve.  
Slowly open test cock # 3, then open the high bleed valve.  
Close high bleed valve, then close low bleed valve.

Observe the differential pressure gage, this value must be at least **1.0 psi or greater.** Record this value for check valve # 2 on the backflow test report form.

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End of test. Make sure all test cocks are closed. Remove hoses and fittings. Slowly open shut-off valve # 2 to restore water supply to the customer.

## TEST PROCEDURE USING A (5) VALVE DIFFERENTIAL GAGE

### PRESSURE VACUUM BREAKER

#### TEST SET UP

Notify customer water will be off, inspect device for leaks, and verify the make, model & serial number.

Flush test cocks and install brass fittings.

#### **REMOVE CANOPY.**

Close all (5) valves on test kit, and close the # 2 shut-off valve.

#### TEST NO. 1

Purpose: To test the air inlet valve.

Attach the high hose to test cock # 2. Open test cock # 2 very slowly. Open the high bleed valve to expel air from gage. Close the high bleed valve. Close the # 1 shut-off valve. Pressure is now captured in the PVB.

The gage diaphragm and low hose must be level with test cock # 2 and/or the area between the check valve and the air-inlet valve.

**Very slowly** open the high bleed valve with your finger on top of the air-inlet valve. The air-inlet valve must open at least **1.0 psi or greater**. Record this value on the test report form.

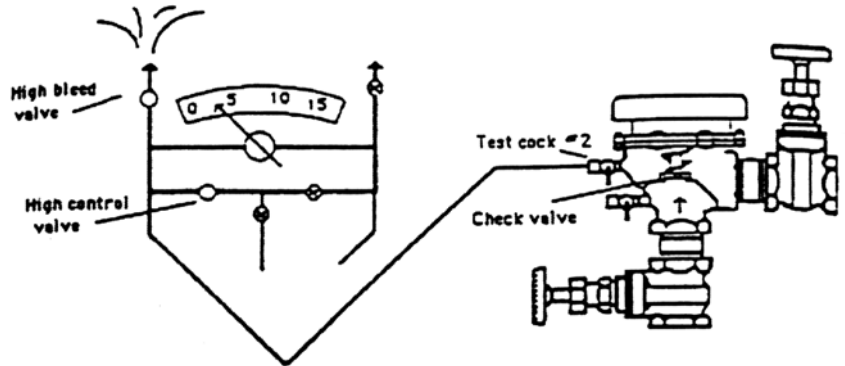
Close the high bleed valve.

#### TEST NO. 2

Purpose: To test the check valve

Close test cock # 2 and remove the high hose from test cock # 2. Open shut-off valve # 1.

Attach high hose to test cock # 1. Open test cock # 1 very slowly. Open high bleed valve to expel air from gage. Close the high bleed valve and close the # 1 shut-off valve. Pressure is now captured in the PVB.



**Again:** The gage diaphragm and low hose must be level with test cock # 2 and/or the area between the check valve and the air-inlet valve.

Open test cock # 2. When water stops running out of test cock # 2, record this value. This check valve must be at least **1.0 psi or greater**.

End of test. Make sure all test cocks are closed. Remove hose and fittings. Place canopy back on PVB. Open shut-off valve # 1 and then shut-off valve # 2.

A PVB must be installed 12" above all fixtures installed down stream and is not approved for back pressure. To verify the PVB is 12" above the highest open fixture or irrigation head, close the # 1 shut-off valve. Open test cock # 2, then open shut-off valve # 2. If water continues to run out of test cock # 2, there is back pressure on the PVB or it is below the highest fixture or irrigation head.

### **WHERE TO SEND YOUR DIFFERENTIAL**

## **PRESSURE GAUGE FOR CALIBRATION**

Gauge calibrations for the differential pressure gauges used in the backflow prevention testing may be calibrated as follows:

The following test kits may be mailed to:

**Watts: TK-9, TK-9A, and TK-99E**

Orange Research, Inc.  
Mr. Don Malizia  
140 Cascade Blvd.  
Milford, Conn. 06460  
Phone (203) 877-5657

**THE GAUGE ITSELF MUST BE REMOVED FROM THE REST OF THE TEST KIT, AND MAILED TO THE ABOVE ADDRESS.** Most often the gauge will not be calibrated, but a new one will be returned to you.

The following test kits may be mailed to:

**Watts: TKDP, TKDR, TK99D, & all other differential gauges can be sent to:**

Bavco  
Mr. John Gould or Mr. Pedro Quraz  
20435 South Susana Road.  
Long Beach, CA 90810  
Phone (310) 639-5231

The following test kits may be mailed to:

**Midwest: Models 830, 844, 845-3, 845-5, 860, 890**

**Conbraco: Models 40-200 TK, 40-200 TK5**

**Ames: Model ATG**

Mid West Instrument Co.  
Mrs. Sue Darrow or Mr. Mike Lueck  
6500 Dobry Drive  
Sterling Heights, MI 48314  
Phone (800) 648-5778 ext 106 or 120

**THE ENTIRE GAUGE AND CASE MUST BE MAILED TO THE ABOVE ADDRESS. YOU MUST ALSO CALL (800) 648-5778.**

The following test kits may be mailed to:

**Midwest: Models 830, 844, 845-3, 845-5, 860, 890**

**Conbraco: Models 40-200 TK, 40-200 TK5**

**Ames: Model ATG**

Speciality Valve & Controls Company  
Mr. Larry Bryan or Mrs. Mary Anne Kelly  
3001 Griffith Street  
Charlotte NC 28203  
Phone (704) 522-9873

The following test kits may be mailed to:

**Promaster: ASRP4, ASDC4, & all other differential gauges can be sent to:**

Astra Industrial Services, Inc.  
Mrs. Kathy Frahm  
3525 Old Conejo Rd.  
Suite 104  
Newbury, Ca. 91320  
Phone (800) 776-1464

The following test kits may be mailed to:

**ITT Barton: Model 246 & 247**

Nuflo Measurement Systems  
Mr. Ben Fuentes  
2500 Steven Road  
Odessa, Texas 79764  
Phone (800) 535-8753

In addition to the above locations (which are manufacturers), you may contact any qualified local vender or shop and have your gage calibrated. You may want to check and compare the price before agreeing to the work.